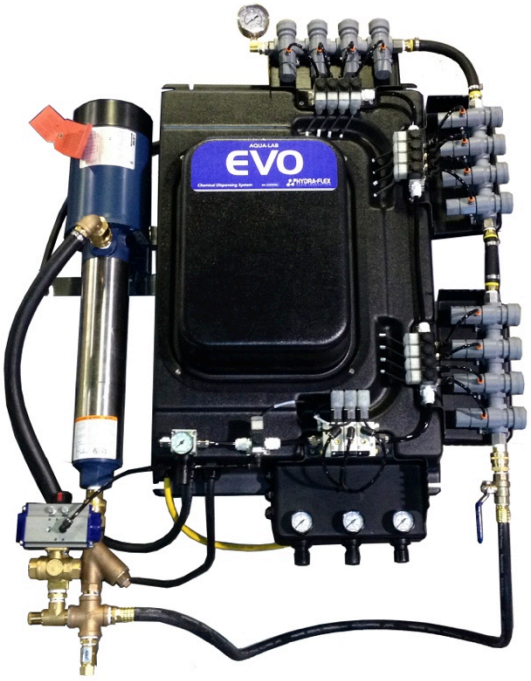
HYDRA·FLEX
FLUID INNOVATION

AQUA-LAB EVO™

Chemical Dispensing System



Istobal User Manual

REV B

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Specifications

1. *Operating water pressure: 180- 200 psi - Do Not Operate Pump Above 225psi*
2. *Pneumatics operating pressure: 80-100 psi – Do Not Operate Valves Above 100psi*
3. *Maximum water source temperature 140° F*
4. *Operating ambient temperature: 40-120° F*
5. *Electrical supply*
    a. *208/230 or 480 volts (3-phase)*
    b. *2 hp pump 7.4 amps @ 230 volts or 3.7 amps @ 480 volts*
    c. *Overload Setting 8.0 @ 230 volts or 4.0 @ 480 volts*
6. *Operate solenoid valves with 24VAC, 24VDC, 120VAC*
    a. *3.5 watts per port*
7. *Water supply*
    a. *3/4" ID line pump feed*
    b. *Inlet pressure: 2-80 psi*
        i. *If pumps are fed from tank, water level must be 54" above pumps.*
8. *Air supply*
    a. *3/8" feed per system*
    b. *20 CFM @ 80-100 psi supply*
9. *Solution lines*
    a. *3/8" ID poly lines for 3.25GPM and below*
    b. *½" ID poly line for 3.25 to 5.5 GPM*
    c. *.63 ID poly line for 5.5 – 8 GPM*
10. *Space requirements:*
    a. *38"W x 44"H with pump assembly*

For additional support call: 952.808.3640

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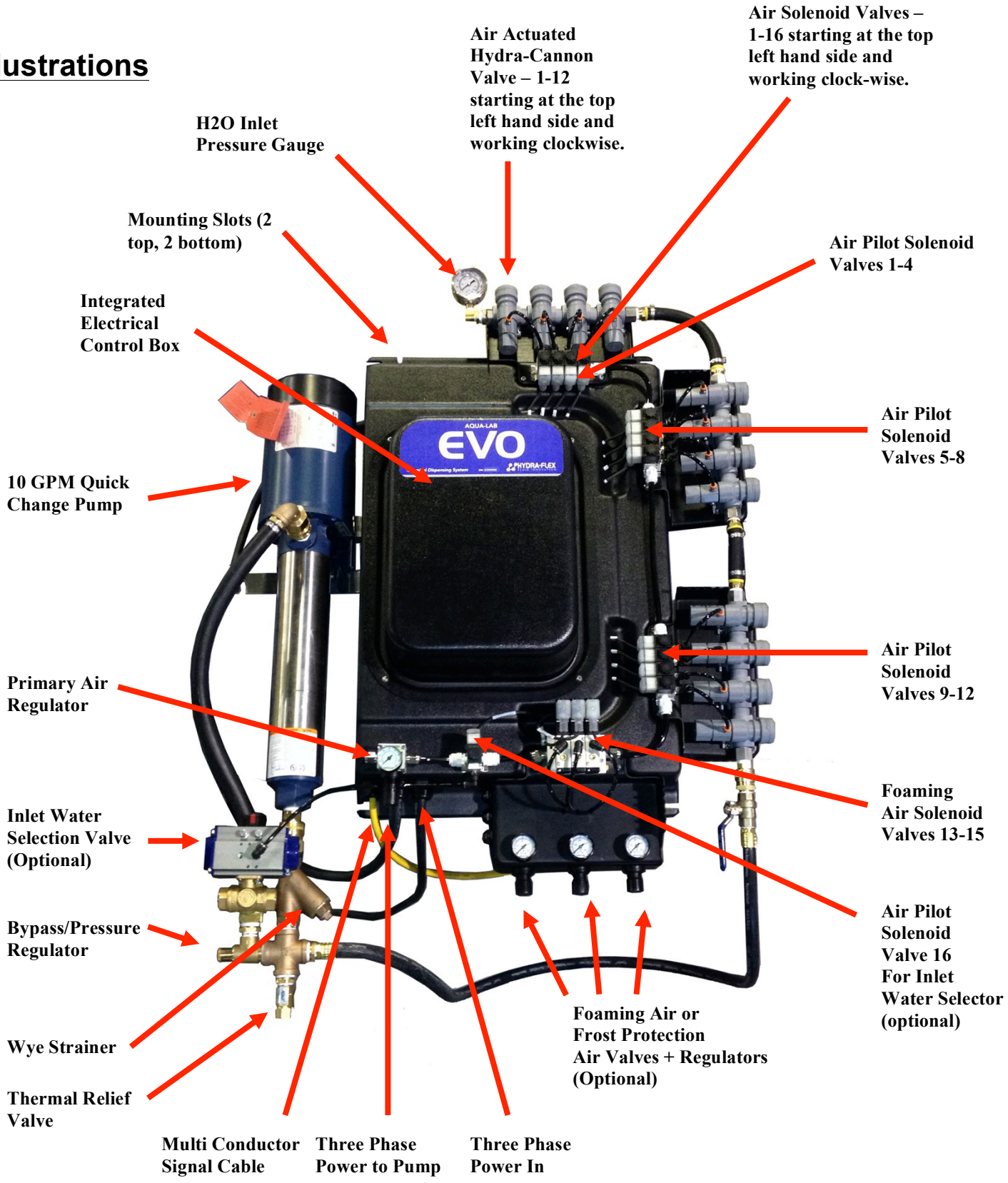
Illustrations


Air Solenoid Valves – 1-16 starting at the top left hand side and working clock-wise.
Air Actuated Hydra-Cannon Valve – 1-12 starting at the top left hand side and working clockwise.
H2O Inlet Pressure Gauge
Mounting Slots (2 top, 2 bottom)
Air Pilot Solenoid Valves 1-4
Integrated Electrical Control Box
Air Pilot Solenoid Valves 5-8
10 GPM Quick Change Pump
Air Pilot Solenoid Valves 9-12
Primary Air Regulator
Foaming Air Solenoid Valves 13-15
Inlet Water Selection Valve (Optional)
Air Pilot Solenoid Valve 16 For Inlet Water Selector (optional)
Bypass/Pressure Regulator
Foaming Air or Frost Protection Air Valves + Regulators (Optional)
Wye Strainer
Thermal Relief Valve
Multi Conductor Signal Cable
Three Phase Power to Pump
Three Phase Power In

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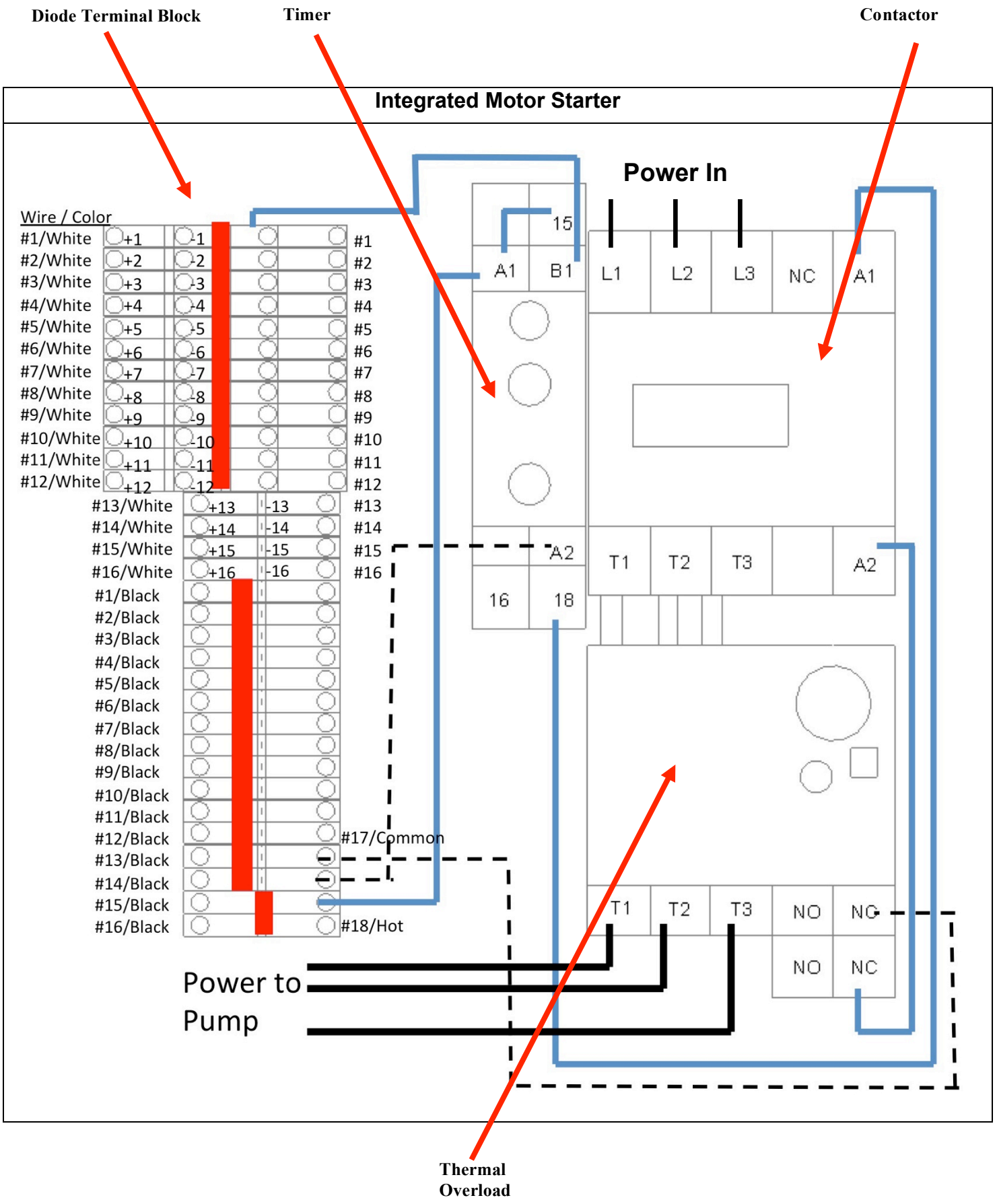

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Principles of Operation

The Aqua-Lab EVO was designed to meet the application requirements of the standard roll-over automatic car wash with an available pump room to store chemical and equipment.

The system is set-up so that all that is required from the car wash controller is an output signal for each valve. The EVO electrical control box uses that signal to open both the 3.5 watt air solenoid valves and to start the pump.

The standard 10 GPM pump produces up to 225 psi of pressure which is regulated down to 200psi by the bypass regulator. (The pump should never run above 225 psi.)

The 200 psi water flows into the Hydra-Cannon manifold which is fitted with 12 air-actuated valves that are controlled by air solenoid valves. The water valves control the flow of water to each injector or flow-thru rinse fitting.

The Chem-Flex injectors are color-coded based on the water flow needed for each individual application, and combine with color-coded chemical metering tips to proportion the precise chemical mix ratio. As water flows into the Chem-Flex injector, the velocity increases. As the velocity increases the pressure decreases creating a vacuum which allows the precise amount of chemical to be pulled into the chamber where it mixes with water.

This precise chemical mixing, along with the proper nozzle, creates an optimal display in the wash bay.

Optional components that are included with the Istobal EVO system include an inlet water selection valve, a foaming air wing, a system-protection pressure switch and the tri-foam manifold.

The inlet water selection value is operated using an air solenoid valve. This valve allows the option of using two different water sources.

The foaming air wing is used as a blow-out frost protection. When the temperature drops below a certain pre-set point, air is forced through the lines, clearing them of water or solution that could potentially freeze and cause damage.

The pressure switch is supplied to ensure that if the pump is not getting pressure, a signal will be sent to the controller to shut the system down.

The tri-foam manifold is a three position quick-connect manifold that fits into a single port to support triple foam or equivalent operations.

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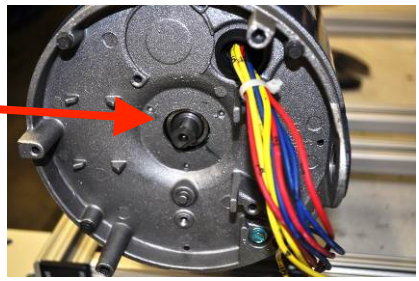
Startup

Pump Priming Instructions

1. Pull the pump outlet line at the manifold quick-connect. Open ball valve and direct toward a drain or container to remove the majority of the air from the pump until a steady stream of water is flowing (approx. 1 min).

2. Start the pump using a command from the controller***. Ensure that pump rotation is correct*** as indicated by the arrow on the bottom of the pump and that 200 psi can be reached.



    - If pump cannot regulate to 200 psi. remove pump motor cover and look at shaft to confirm correct rotation

3. Start the pump and slowly open ball valve until it is wide open. Allow to run for 60 seconds to flush lines and then close valve.

4. Reconnect the high pressure line to the Hydra-Cannon Manifold and open valve.

5. Confirm that the pump can obtain 200 psi while firing solenoids and that the pump housing (stainless steel tube) is cool to the touch after a minute in operation.

    - If housing is hot or noisy then pump did not prime correctly.

6. If pump does not prime, repeat steps 3-5

7. Verify pump prime 24 hours after operation to ensure prime held. Pay close attention to the temperature of the pump housing (stainless steel area).If it starts getting hotter than the supply water or greater than 140°, then it is likely that the pump did not prime correctly which **will cause damage** to pumps. The motor housing (painted portion) will be hot during operation.

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Istobal M22 / M24 Initial Set Up

Application	Injector	Nozzles
Pre Spray / 2 step	618098 – 3.25gpm	10x 0880, 4x 632.676
Shampoo	618086 – 2.25gpm	2x 0880, 10x 0680
Shampoo Rinse	Flow Thru - 3000173	See shampoo
White Foam	618086 – 2.25gpm	As Shipped
Triple Foam	3x 618070 – 1.5gpm each	As Shipped
Wax / Super Wax	618096 – 3.25gpm	2x 632.676, 2x0880
Horns Rinse	Flow Thru - 3000173	See Wax
Low Pressure Under Spray	Flow Thru - 3000173	As Shipped
CTA	TBD	TBD
Bug Spray	TBD	TBD

Optimizing the System

Consistently achieve the desired cleaning and presentation/performance using the least amount of chemical and water

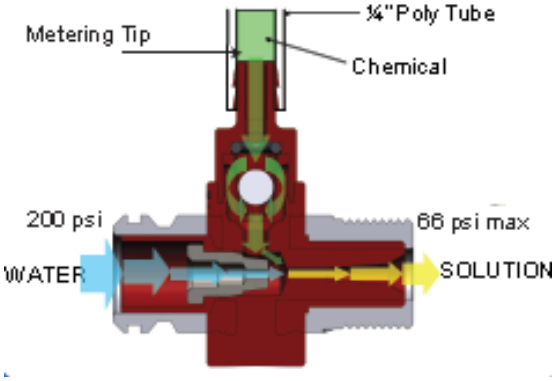
Injectors vs. Metering Tips vs. Nozzles

The key to optimizing the system is through trial and error.
Don't be afraid to try these steps to achieve your ideal performance.

What do injectors do?
- Increases or decreases the amount of water in the solution

What do metering tips do?
- Increases or decreases the amount of chemical in the solution

What do nozzles do?
- Determines the pattern and backpressure of the solution



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Application Optimization (repeat for each application)

- Application too wet
  - Increase air
  - Reduce injector size (decreases water)
  - Increase metering tip (increases chemical)
- Application too dry
  - Decrease air
  - Increase injector size (increases water)
  - Decrease metering tip (decreases chemical)
- Nozzle sputters
  - Decrease air
  - Decrease nozzle(s) and/or size used on arch
  - Increase injector size (increases water)
- Too much chemical used
  - Decrease metering tip
  - Decrease metering tip and injector size (to maintain desired ratio)
- No chemical
  - Check vacuum of injector (see instructions on page 9)
  - Check foot valve
  - Check metering tip
- Nozzle fan pattern not filled
  - Reduce nozzle size
  - Increase injector size (increases water)
- Water not present at all nozzles on arch
  - Verify check valves are functioning
  - Verify nozzles are not plugged
  - Reduce number of nozzles
  - Reduce nozzle size
  - Increase injector size (increases water)

Chemical Usage Measuring

Verify titration of chemicals before proceeding

1. Setup lab scale with small bucket of chemical to be measured.
2. Put the suction line into the bucket.
3. Run the application being tested to “prime” the line. (All air bubbles must be removed for accuracy)
4. Record the **Initial Weight** from the scale. (Tarring the scale with weight on the scale can affect accuracy)
5. Run the application for 6 vehicles (or manually for the same it would be on for 6 vehicles).
6. Record the **Final Weight** from the scale.
7. Subtract the Initial Weight from the Final Weight to determine the weight of used product.
8. Divide this **Used Weight** by 6 to get a per car weight.
9. Divide the **Per Car Weight** in grams by the specific gravity of the chemical to determine the milliliters of chemical used per vehicle.
10. Repeat for each chemical application.

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Recommended Maintenance

The recommended service and maintenance on the AQUA-LAB System are as follows.

Monthly
- Check air regulator
- Check water filter and replace as needed (if installed)

Semi-Annually
- Check and replace injector metering tips
- Check and clean wye strainer
- Inspect and replace chemical lines as needed
- Ensure lines are tightly secured to injector hose barbs, clip 1” off old hose as needed that was stretched by hose barb

Annually
- Clean water regulator
- Inspect motor starter for corrosion, if identified order replacement/spare parts

1-3 Years
- Inspect and replace injectors
- Replace water valves
- Replace main pressure regulator

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Troubleshooting

Injector Vacuum Check (for troubleshooting injectors)

1. At the Chem-Flex injector, remove the chemical feed line from the injector hose barb.
2. Attach the tubing of the vacuum gauge to the Chem-Flex hose barb
3. With the pump(s) on, manually activate the chemical that is to be tested at the main car wash control cabinet. An injector that is working properly will have a reading greater than or equal to (≥) 20 in Hg
4. If injector is not functioning:
    a) Check metering tip for clogs (can be tested with no metering tip to ensure injector is performing)
    b) Try smaller injector (this will produce less flow and thus less backpressure)
    c) Remove a nozzle(s) at the arch, allowing water to free flow (this will reduce backpressure)
5. Repeat steps 2-4 for each chemical lane that a vacuum reading is needed for.
6. Once testing is complete, turn off the AQUA-LAB pump from the main car wash control cabinet.

There is a variation of performance in the injectors that comes from slight variations in the dimensions of the parts and in assembly that are unavoidable. It is common to see the resultant vacuum range from 20 in Hg all the way up to 28. There is also variation in the through hole size on the meter tips from Dema (within their manufacturing tolerances). Using the same tip color from site to site is a good starting point. However with the potential for variation from part to part it is reasonable to still need to do some adjustments from there.

Injector Issues

Problem	Potential Causes	Solutions
Injector is not drawing chemical – PASSES vacuum pressure check	Clogged chemical feed	Check chemical hose, foot valve, metering tip and hose barb for debris or clogs
Injector is not drawing chemical – FAILS vacuum pressure check	Too much back pressure on injector	Clean or replace downstream check valves, increase nozzle size or quantity, use larger tubing, or use smaller flow injectors
	Clogged injector check valve	Blow compressed air through the chemical hose barb on the injector to remove debris
	Clogged injector nozzle	Remove injector and blow out any debris with compressed air
	Defective Injector	Replace injector
	Product Specific – Sonny's Rain Bar	Remove elbow at inlet to foam generator and remove nozzle
	Manifold Inlet Clogged (rare)	Remove end fittings and retention rod. Clean out inlet holes to allow full flow.
No Flow from injector	Valve malfunction, valve not opening	Ensure minimum 60 psi on primary air regulator, ensure valve receiving signal
	Clogged injector	Remove injector and blow out debris with compressed air
	No water supply	Check that the system has a supply of water
Injector Stainless Steel disintegrating	Strong Acid	Call Hydra-Flex and order composite version of injectors

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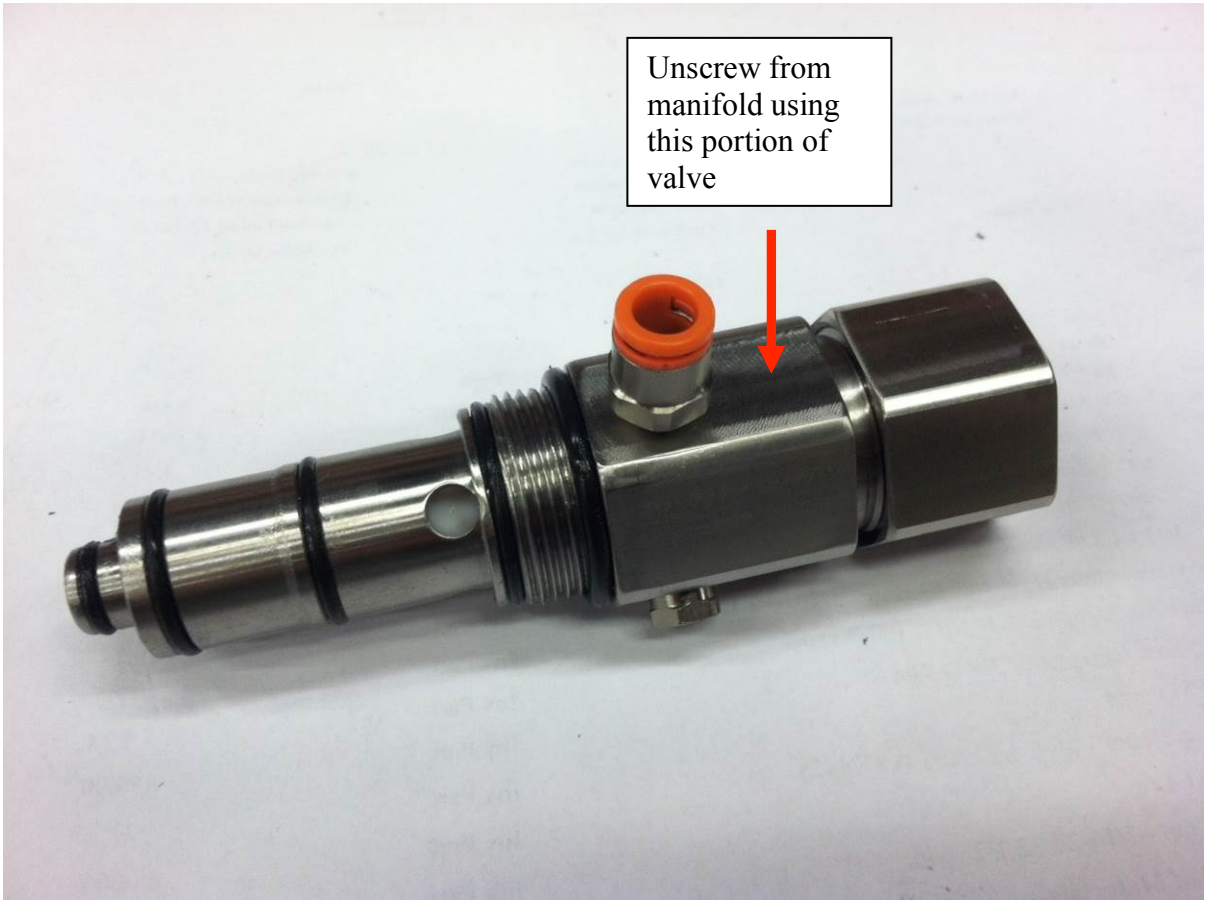
Air Operated Valve Replacement

1. Shut off the ball valve to Hydra-Cannon manifold
2. Disconnect air line from front of valve
3. Unscrew quick connect fitting by hand **(DON'T LOSE BLACK WASHER)**
4. Unscrew valve assembly from the Hydra-Cannon manifold
5. Screw new valve into manifold until hand tight and threaded pilot port is facing forward
6. Remove the cap from pilot port and thread in quick connect fitting to front of valve – **Hand Tight ONLY**
7. Push air line back into fitting
8. Open the ball valve to the Hydra-Cannon manifold



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Pump Issues

Problem	Potential Causes	Solutions
Pump Operates, but only delivering 100-150 psi	Incorrect Motor Rotation	Reverse rotation by interchanging two leads
Pump Operates, but delivers little or no water	Pump not Primed	See Priming Instructions
	Missing 1 of 3 phases	Wire according to diagram
	Inadequate water supply	Check pressure on inlet side of pump to be sure positive pressure is maintained
	Undersized piping	Replace with larger piping
	Leak on the Inlet side	Make sure connections are tight
	Worn or defective pump parts	Replace worn parts or entire pump, clean parts if required
Pump won't start or run at full speed	Constant Hot Not Connected	Make sure constant control voltage is supplied in car wash controller.
	Blown fuse or circuit breaker	Could be due to blown pump motor. Try to turn breaker back on or replace fuse. If breaker trips after trying to fire motor, motor is most likely burned out. Replace with new motor and pump.
	Defective Motor Starter contactor	Replace motor starter contactor
	Thermal Overload set too low	Adjust setting on thermal overload to match voltage
	Incorrect Motor Voltage	Voltage must be within 10% of motor rated voltage
	Defective Motor	Replace Motor
	E-Stop is depressed	Unlock E-stop
	Pump components damaged	Replace worn part or entire pump
	Not primed	Reprime Pump
Excessive Noise from Pump	Pump not secured firmly	Secure properly
	Restricted Inlet	Clean or correct restriction
	Water regulator fluttering / chattering	Try to adjust regulator down and then back up or replace regulator
	Cavitation (sounds like marbles in pump)	Increase inlet size
	Worn mechanical seal	Replace Pump
Pump Leaks		

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Pressure Regulator Issues

Problem	Potential Causes	Solutions
System won't regulate up to 200 psi	Pump not primed	Follow priming instructions
	Debris in regulator	Remove regulator and clean out debris
	Motor rotation incorrect	Verify rotation
	Opening too many valves at once	System is limited by size of pump and size of injectors, increase flow by adding secondary pumps or reduce size / number of injectors open
	Defective check valve (if applicable)	Replace check valve
	Defective Regulator	Replace regulator
	Defective Pump	Replace Pump

Flow / Arch Issues

Problem	Potential Causes	Solutions
Flow at arch is too low	Incorrect injector flow rate selection	Replace with larger injector
	System pressure too low	Ensure system pressure is set at 200psi
	Foam Generator Plugged	Ensure cleaned and clear
	Downstream plumbing restrictive	Increase size of plumbing / tubing, ensure check valves are cleaned or new, reduce elbows in line or other turns that would restrict

Valve Issues

Problem	Potential Causes	Solutions
Valve won't open	Air pressure too low	Ensure primary air regulator reading at least 60 psi, turn up to 80-90psi if possible and check again
	Internal valve o-ring jammed / twisted	Remove valve from manifold, Carefully remove top of valve (**caution – under high spring pressure)** push white piston up with small allen wrench from opposite end and check o-ring condition. Replace and lubricate if needed.
Valve leaks air or water out top	Internal o-ring seal damaged / worn	Remove valve from manifold, Carefully remove top of valve (**caution – under high spring pressure)** push white piston up with small screwdriver from opposite end and check o-ring condition. Replace with 018 Viton O-ring and lubricate with Dow 111 valve lube.
Valve remains open after signal is off	Manifold pressure is above 230 psi	Reduce pressure to manifold to 200 psi operating pressure

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Appendix

Chem-Flex Injectors – Chemical Dilution Ratios

(Assumes feed pressure of 200 PSI)

	NOZZLE SIZE								
Flow Rate (GPM) at 200 PSI	0.25	0.50	0.75	1.00	1.50	2.00	2.25	3.25	5.50
Injector Color →	White	Yellow	Tan	Red	Orange	Gray	Blue	Green	Green
Metering Tip ↓	0.029" (0.7 mm)	0.040" (1.0 mm)	0.051" (1.3 mm)	0.057" (1.4 mm)	0.070" (1.8 mm)	0.083" (2.1 mm)	0.086" (2.2 mm)	0.098" (2.5 mm)	0.125" (3.2 mm)
Copper	1: 57	1: 104	1: 155	1: 146	1: 281	1: 406	1: 468	1: 629	1: 1074
Pumpkin	1: 43	1: 82	1: 119	1: 126	1: 238	1: 348	1: 398	1: 554	1: 946
Burgundy	1: 34	1: 67	1: 97	1: 111	1: 207	1: 304	1: 347	1: 495	1: 845
Lime	1: 28	1: 57	1: 81	1: 100	1: 183	1: 270	1: 307	1: 447	1: 764
Tan	1: 28	1: 57	1: 81	1: 100	1: 183	1: 270	1: 307	1: 447	1: 764
Orange	1: 23	1: 44	1: 64	1: 78	1: 137	1: 196	1: 215	1: 314	1: 536
Turquoise	1: 17	1: 31	1: 45	1: 55	1: 91	1: 126	1: 134	1: 197	1: 336
Pink	1: 14	1: 24	1: 35	1: 42	1: 68	1: 93	1: 98	1: 143	1: 244
Light Blue	1: 11	1: 17	1: 24	1: 31	1: 47	1: 64	1: 66	1: 98	1: 166
Brown	1: 10	1: 15	1: 22	1: 28	1: 43	1: 58	1: 59	1:8 88	1: 150
Red		1: 12	1: 17	1: 23	1: 34	1: 45	1: 46	1: 69	1: 116
White		1: 12	1: 16	1: 22	1: 31	1: 42	1: 43	1: 64	1: 108
Green		1: 11	1: 14	1: 20	1: 28	1: 37	1: 38	1: 55	1: 94
Blue		1: 10	1: 12	1: 17	1: 23	1: 30	1: 31	1: 46	1: 77
Yellow			1: 9	1: 12	1: 16	1: 20	1: 22	1:31	1: 52
Black				1: 10	1: 13	1: 16	1: 17	1: 24	1: 40
Purple				1: 6.6	1: 8.3	1: 9.0	1: 10	1: 13	1: 21
Gray				1: 5.3	1: 6.7	1: 6.9	1: 7.6	1: 10	1: 16
Open				1: 4.9	1: 5.3	1: 5.2	1: 6.0	1: 6.1	1: 10

NOTE: Dilution ratios given above are based on drawing water through the metering tips and are meant as a starting point for system configuration. Results are expected to vary when drawing chemicals due to differences in viscosity and temperature

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Chem-Flex Injector Part Numbers

Part Number	# Barbs	GPM
618029	1	0.25
618040	1	0.50
618051	1	0.75
618057	1	1.00
618070	1	1.50
618083	1	2.00
618086	1	2.30
618098	1	3.20
618125	1	5.40
629029	2	0.25
629040	2	0.50
629051	2	0.75
629057	2	1.00
629070	2	1.50
629083	2	2.00
629086	2	2.30
629098	2	3.20
629125	2	5.40

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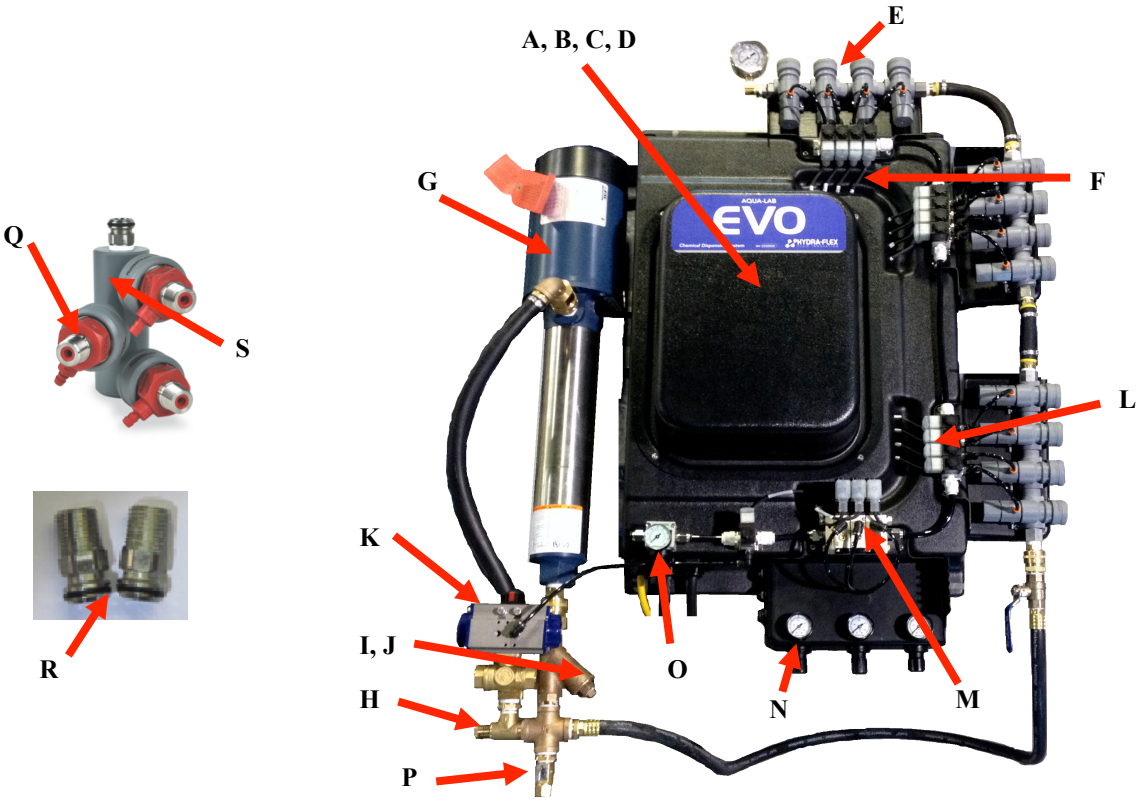
Replacement Parts List – Aqua-Lab EVO



	Part Name	HFI Part Number
A	Contactor	3000864
B	Thermal Overload	3000862
C	Diode Terminal Block	
D	Timer	3000664
E	CPVC Air Valve	3000931
F	24V Din I Solenoid Cable	3001157
G	10 GPM Pump	3001159
H	Bypass Regulator	3000951
I	Wye Strainer	3000668
J	Wye Strainer Screen	3000517
K	Inlet Ball Valve	3001165
L	Pilot Air Solenoid Valve	3001153
M	Foaming Air Valve	1001429
N	Foaming Air Regulator	3000808
O	Primary Air Regulator	3001160
P	Thermal Relief Valve	3000323
Not Shown	Air Check Valve	3000819
Q	Orange Injector – 1.5 GPM	618070
Q	Blue Injector – 2.25 GPM	618086
Q	Green Injector – 3.25 GPM	618098
R	Flow-Thru Adapter	3000173
S	Tri-Foam Manifold	1001087

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AQUA-LAB WARRANTY

Factory Limited

Hydra-Flex Inc warrants its equipment to be free from defect in material or workmanship under proper normal proper use for a period of one (1) year beginning the date of purchase.

The Hydra-Flex Inc's liability shall be limited to repair or replacement of parts found to be defective within the warranty period and following Hydra-Flex Inc's inspection. Hydra-Flex Inc shall have the option requiring the return of defective material to establish the purchaser's claim. In the event of repair or replacement this limited warranty is non-cumulative. Neither labor nor transportation charges are included in this warranty.

This warranty is based upon the proper care and maintenance of the warranted equipment. Warranty does not apply if the merchandise is altered or modified in any way. Warranty does not apply to any equipment which has been subject to misuse, inappropriate use of tools, including exposure to harsh chemicals, neglect, lack of maintenance, freezing, fluid hammer, accident, third party damage, fluid impurities such as sand or minerals, acts of God or acts of war. Nor does it apply to any equipment which has been repaired or altered by anyone not so authorized by Hydra-Flex Inc. All equipment must be properly installed in accordance with specified plumbing, electrical, and mechanical requirements. The warranty does not apply to normal wear and tear or routine maintenance components as described in the equipment manual.

Except as expressly stated herein, Hydra-Flex Inc shall not be liable for damages of any kind in connection with the purchase, maintenance, or use of this equipment including loss of profits and all claims for consequential damages. This limited warranty is in lieu of all other warranties expressed or implied. Hydra-Flex Inc neither assumes nor authorizes any person to assume for it any other obligation or liability in connection herewith. This warranty is neither assignable nor transferable.

Transportation damage claims are to be submitted to the carrier of the damaged material.

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